Prevalence of infection with *Salmonella* in Irish pig farms

Rowe, T. [1], Leonard, N.[1], Kelly, G.[2], Lynch, P.B.[3], Egan, J.[4], Quirke, A-M.[1] and Quinn, P.J. [1]

[1]Faculty of Veterinary Medicine, UCD, Dublin 4, Ireland, Phone: +353-1-6687988, Fax: 353-1-6608656, Email: nola.leonard@ucd.ie [2]Department of Statistics, UCD, Dublin 4, Ireland, [3]Teagasc, Moorepark, Fermoy, Co Cork, Ireland, [4]Central Veterinary Research Laboratory, Abbotstown, Dublin 15, Ireland.

Abstract: The objectives of this project were to determine the frequency of infection with *Salmonella* serotypes in Irish pig farms and to identify the point in the production cycle at which infection is acquired. Salmonellae were isolated from pens in 30 of 59 farrow-to-finish farms sampled. Herds classified as low risk were as likely to be positive as high-risk herds. The prevalence of infection was 2.3% in lactating sows, 5.1% in dry sows, 4.6% in gilts, 5.9% in fatteners, 4.8% in second stage weaners and 8.0% in first stage weaners. Prevalence of infection in lactating sows was lower than in other groups sampled ($P<0.05$) and was less in second stage than in first stage weaners ($P\leq0.05$). The predominant serotypes isolated were Typhimurium and Derby. Results show that infection was prevalent in all production stages. Classification of herds based on serological results of fatteners may not reflect the prevalence of infection in other production stages.

Keywords: Production stage, bacteriology, infection risk

Introduction: Limited Irish data is available on the bacteriological prevalence of infection with *Salmonella* serotypes at all stages of pig production. In order for effective control measures to be implemented on farms, information is required on prevalence and transmission of infection. Thus the objectives of this project were to determine the frequency of infection with *Salmonella* serotypes on Irish pig farms and to identify the point in the production cycle at which infection is acquired.

Materials and methods: A total of 59 farrow-to-finish herds with ≥200 sows were selected for sampling. Based on *Salmonella* infection rates as determined by an ELISA (Nielsen *et al.,* 1995) conducted on randomly selected meat juice samples, Irish pig herds are categorised at slaughter into three groups: Category 1, <10% samples positive at OD = 40%; Category 2, 10-50% positive; Category 3, >50% positive. Farms from all categories were sampled. Composite pen faecal samples were collected from 2 to 5 pens of first and second stage weaners, fatteners, dry and farrowing sows. Faecal samples were cultured using pre-

enrichment in buffered peptone water, selective enrichment in both Rappaport Vassiliadis broth and semi-solid Rappaport Vassiliadis medium and subculture onto brilliant green agar and mannitol lysine crystal violet brilliant green agar. Suspect colonies were identified by inoculation of triple sugar iron agar slopes and lysine decarboxylase broths, followed by serotyping. Statistical analysis was carried out by fitting a logistic regression random effects model to the data using the Glimmix macro from SAS statistical software. Infection was the outcome variable with farm category a predictor variable and farm as random effect.

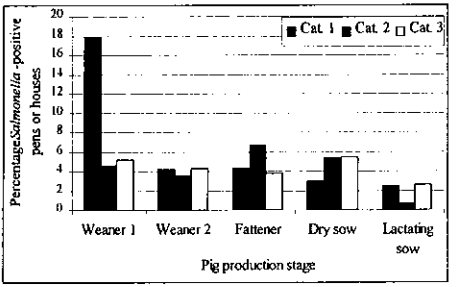
Results: Salmonellae were detected in 30 of 59 farms tested. Category 1 farms were no less likely to be positive than Category 3 farms. The prevalence of infection at the different production stages is shown in Table 1. Prevalence of infection in lactating sows was lower than in other groups sampled ($p < 0.05$) and was less in second stage than in first stage weaners ($p \leq 0.05$). The prevalence of infection in first stage weaners on Category 1 farms was significantly higher than in most other production stages on farms in any of the three categories ($p < 0.05$) (Fig. 1). Dry sows in Category 1 farms were more likely to be negative than dry sows in Category 2 or Category 3 farms ($p \leq 0.1$). The predominant serotypes isolated were Typhimurium and Derby. Infection with both serotypes seldom occurred in pigs at a given production stage.

Pig type	*Percentage positive pens or houses*	*Confidence interval*
Weaner stage 1	8[a]	4.9-12.9
Weaner stage 2	4.8[b]	2.8-8.0
Fattener	5.9[a, b]	3.7-9.5
Pregnant sow	5.1[a, b]	2.9-8.9
Lactating sow	2.3[c]	1.1.4.6

[a, b] Values within columns with different superscripts are significantly different (P<0.05)

Table 1. Bacteriological prevalence of *Salmonella* infection in pens housing different types of pigs in 59 herds.

Figure 1. Recovery of Salmonella in faeces from each production stage in 59 farms relating to herd category



Discussion: *Salmonella* infection was found at similar levels in all categories of herds, indicating that classification of herds based on serological prevalence of *Salmonella* in fatteners may not reflect accurately the prevalence of infection in other production stages. Such findings may be explained in part by differences

between herds in time of acquisition of infection and seroconversion. Early acquisition of infection in 1st stage weaners in Category 1 herds may result in pigs becoming both bacteriologically and serologically negative by time of slaughter. This might explain why herds are classified as Category 1 whilst containing high infection levels in young pigs. Funk *et al.* (1999) also documented different shedding patterns in different herds. Significantly lower *Salmonella* levels in lactating sow houses compared to other production stages may be a reflection of differing hygiene practices, which are likely to be better for lactating sows. The finding of only one serotype at any given production stage in most farms is suggestive of horizontal transmission within each stage, which is consistent with the findings of Dahl *et al.* (1996). Evidence of infection at all production stages on farms of all categories, together with increased levels of infection in dry sows in Category 2 and 3 herds, suggests that control measures aimed at the fattening stage only are unlikely to be successful in the long term.

Acknowledgements The financial support of Teagasc and The Pig Levy Research Fund and the help of the participating farmers, pig veterinarians and the staff of the bacteriology laboratory in the CVRL, Abbotstown, is gratefully acknowledged.

References Dahl, J., Wingstrand, A., Baggesen, D. and Nielsen, B. (1996): Spread of *Salmonella* infection in pens and between pens. In: *Proceedings of the 14th International Pig Veterinary Society Congress,* Bologna, Italy, 7-10 July p. 172.

Funk, J.A, Davies, P.R. and Nichols, M.A. (1999): Longitudinal study of *Salmonella* shedding in 2 three-site swine production systems. In: *Proceedings of the 3rd International Symposium on Epidemiology and Control of Salmonella in Pork,* August 5-7, Washington, DC, USA, pp.131-136.

Nielsen, B., Baggesen, D., Bager, F., Haugegaard, J. and Lind, P. (1995): The serological response to *Salmonella* serovars *typhimurium* and *infantis* in experimentally infected pigs. The time course followed with an indirect anti-LPS ELISA and bacteriological examinations. *Vet. Microbiol.*, **47**: 205-218.